

# FIRST RESPONDERS' LIFELINE: HOW TO VERIFY AND OPTIMIZE MCX NETWORK PERFORMANCE

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Make ideas real



# Types of MCX testing

**1**

## Conformance Testing

Ensuring that Implementation under Test conforms to the 3GPP Standard

GCF Conformance Tests

**2**

## Performance Testing

Ensuring that Implementation(s) under Test meet Key Performance Indicators (KPIs)

GCF Performance Tests

**3**

## Interoperability Testing

Ensuring that two or more Implementations under Test interoperate (work together)

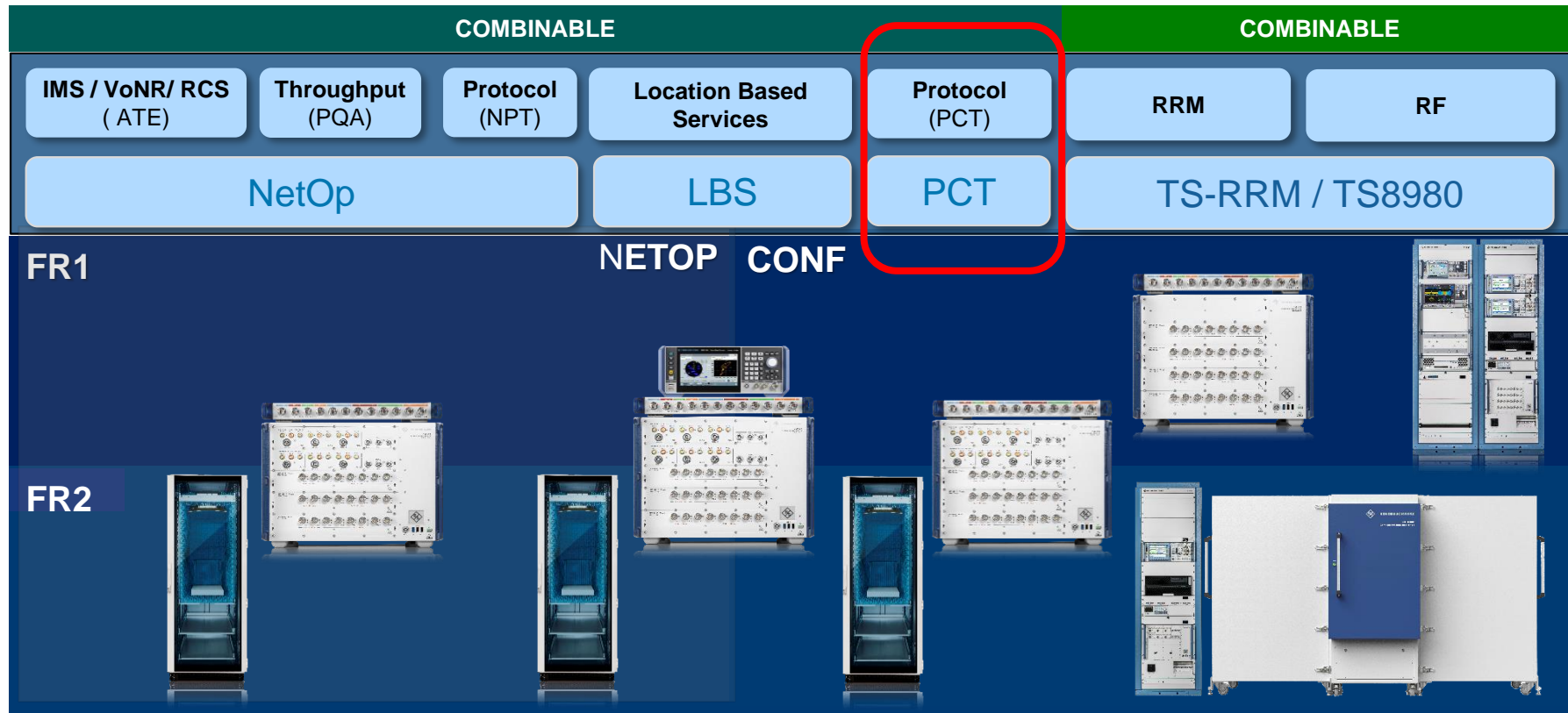
ETSI MCX/FRMCS Plugtests

R&S CMX500



## Part 1: Conformance testing

# R&S 5G FR1/FR2 TEST Solutions Overview



# Contest

## Framework for automatized test excution and result handling

- Intuitive GUI to configure and execute test plans
- Graphical customization and parameterization of test cases
- Creating a sequence of test cases

Parameter Setup

Filters: Operating Bands

Specification: 3GPP | Type to search...

Band Licenses: Available 4 / 4 | Selected 1 / 4

DUT Capabilities: DC\_2A\_n41A, DC\_2A\_n71A, n41, n71

Apply Changes to Test Plan | Discard Changes

Sort Applications by Name | Optimize Performance | Collapse all Groups | Execute Test Plan by | Parameter Set

Applications	ECs	Band Configurations	Runs	Run Time
RF-SA TMO FDD/TDD L_5G_RF_SA_n41_NR_ACLR_1 FDD/TDD 6.8.0	1 / 5	DC_2A_n41A	0	0:00:00 ± 0:00:00
RF-EN-DC TMO FDD/TDD L_5G_RF_NSA_n41_NR_ACLR_2 FDD/TDD 6.8.0	1 / 5	1 / 1	1	0:00:00 ± 0:00:00

2 / 2 Application(s) | 5 ECs | 1 Band Configurations | 1 (0:00:00 ± 0:00:00)

Parameter Setup

Filters: Operating Bands | Parameters

DUT Capabilities: Type to search...

Primary Carrier	Bandwidth	Channel Type	SCS	Sub5cs
FDD 13	5	Mid	Lte	No 5SB
n66	10	Mid Low	15	15

Available 142 / 142 | Selected 2 / 142

DC\_66A\_n90A, DC\_71A\_n66A, ENDC, DC\_13A\_n66A, Nr, n1, n2, n3, n5, n7, n8



# R&S CMX500 (TP 292) Validation Status

## ► GCF (CAG#78) and PTCRB (PVG#104)

- Total **595** individual EN-DC and NR PCT test cases validated
- Currently **1149** TC validated at PTCRB
- **> 13500** band combinations in GCF,
- **> 10600** band combinations in PTCRB
  
- R&S PCT is leading in GCF individual TC validation
- R&S PCT is leading in Rel16 GCF validation
- R&S is leading in GCF RedCap



TP 292



# Interoperable solutions require Certification

## GCF announces certification of Broadband Mission Critical Services

11 Jun 2024

*Collaboration with TCCA supports next generation of MCS products and services*

**JUNE 11<sup>th</sup>, 2024**

The **Global Certification Forum (GCF)** today announced that it is adding 3GPP-based Mission Critical Services (MCS) to its certification programme, also referred to as MCX.

MCS and critical communications provide essential voice and data connectivity to first responders, public safety services, transportation sectors, and more. The next generation of MCS, also referred as Broadband MCS, are being delivered over LTE cellular networks and evolving towards 5G, thus providing the services required for emergency response.

Lars Nielsen, CEO at GCF, said: "This new MCS certification follows a multi-year collaboration between GCF and TCCA, and the members of both organisations at **Mission Critical Services Work Stream**. For the first time, MCS product vendors can demonstrate conformance of different MCS clients and servers based on global standards maintained by 3GPP."

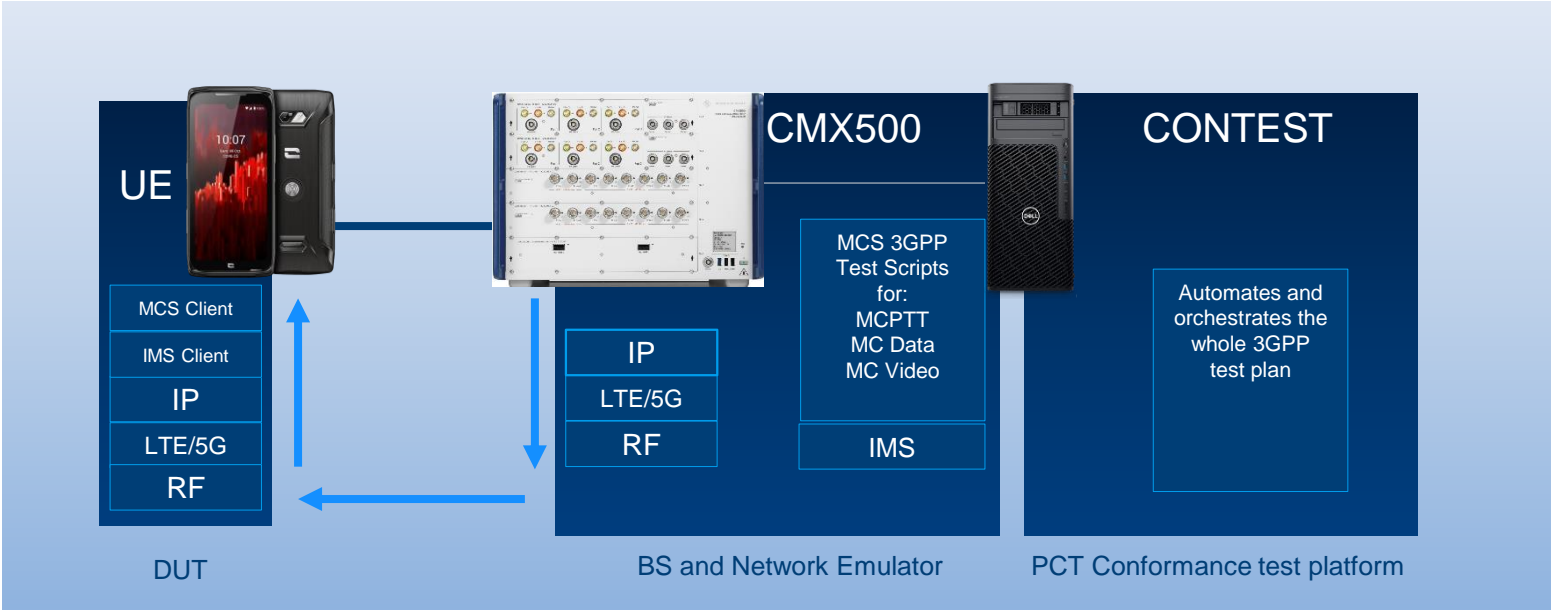
Kevin Graham, CEO at **TCCA**, said: "Following several years of work from members of TCCA and GCF, we now have an agreement, at industry level, on how to prove compliance of mission critical services to the market – based on standards, with the highest quality requirements."

We validated 36TC for WI-288 on CAG#78bis

- The WI is activated
- TP292 R&S is the only validated platform
- TCs available with PCT4-KC521 on CMX500



# MCX Device – R&D and Conformance Test Solution





# R&S CMX500 (TP 292) Validation Status

Today	H1/25	H2/25	H1/26
WI-288 MCPTT, Release 14 ✓		WI-328 MCVideo, Release 14	WI-329 MCData, Release 14
	WI-330 MCPTT, Release 15	WI-331 MCVideo, Release 15	WI-331 MCData, Release 15

- Dates may vary due to market needs
- Order of release may vary due to market needs

# Part 2: Performance Testing



1

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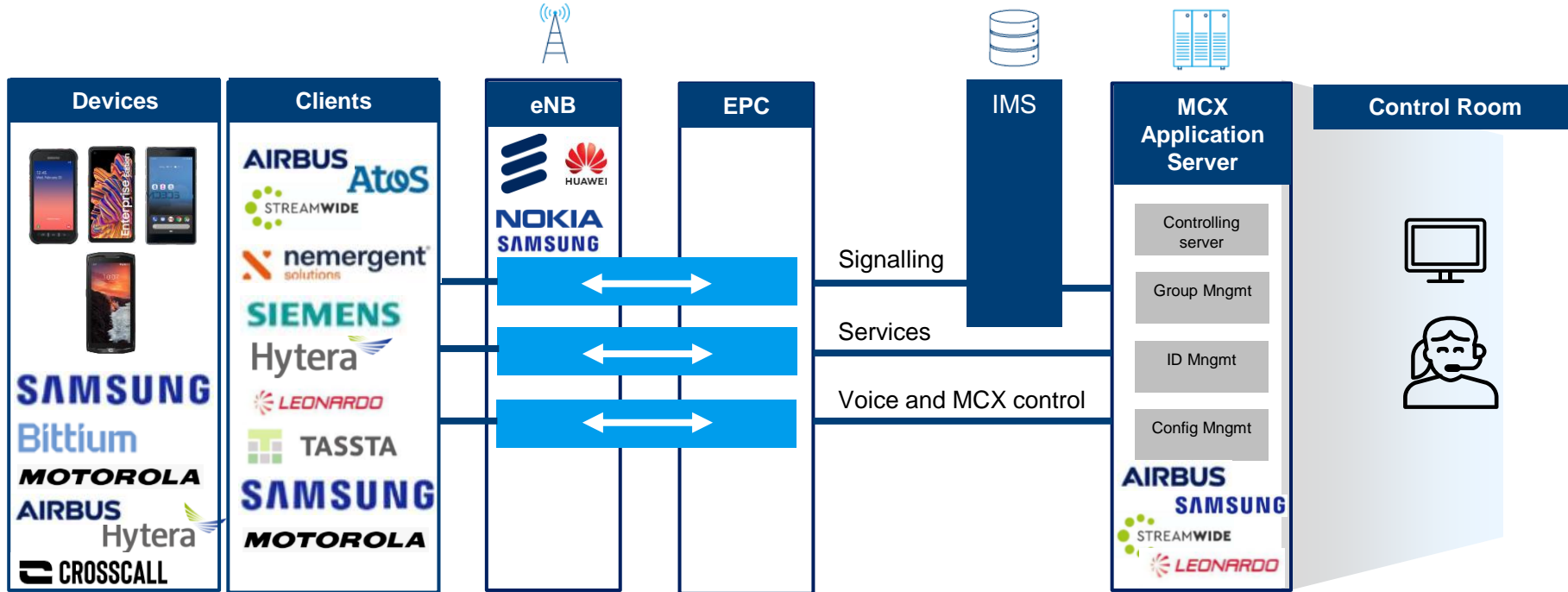
# ENSURING COMMUNICATION SERVICES FOR FIRST RESPONDERS

- ▶ Current MCX implementations often rely on commercial networks
  - RAN sharing between various operators for maximizing coverage and capacity
- ▶ MCX network running on top needs to have QPP (quality, priority and pre-emption) capability



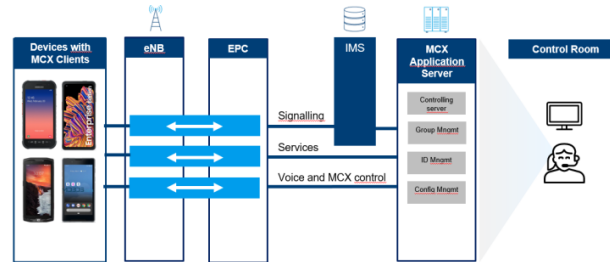
Performance testing in advance, to avoid fatal outcomes afterwards, is the key!

# A COMPLEX MCX ECOSYSTEM



How to verify e2e performance degradation?

# MCX PERFORMANCE TESTING – LAYERED APPROACH



## Passive

L1



Coverage, interference, system information (MIB, SIB) decoding, Time Sync measurements with scanner

L2

## Standard Active



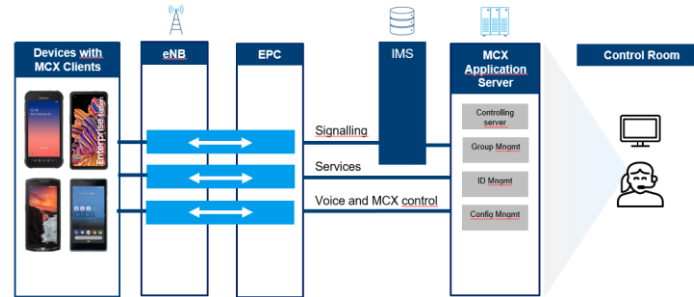
Standard DL/UL QoE/QoS UE based testing (capacity, connectivity, latency), Layer 1-3 and IP troubleshooting

L3

## MCX Active

Dedicated testing of MCX network performance from UE perspective

# MCX PERFORMANCE TESTING – LAYERED APPROACH



L1

Coverage, interference, system information (MIB, SIB) decoding, Time Sync measurements with scanner

Passive



L2

Standard DL/UL QoE/QoS UE based testing (capacity, connectivity, latency), Layer 1-3 and IP troubleshooting

Standard  
Active

L3

Dedicated testing of MCX network performance from UE perspective

MCX  
Active



# QUALIPOC ANDROID KEY FEATURES

## ► Intuitive User Interface

- The intuitive and customizable user interface is based on the latest features of today's smartphone technology and offers an easy operation

## ► Extensive set of service tests

- Including call tests, voice quality (including POLQA, PESQ, and SQuad08) data tests, video streaming including video quality (J.343.1) as well as app service tests

## ► High grade of customization

- Create your own monitor with the desired parameters based on templates

## ► Advanced RF optimization feature

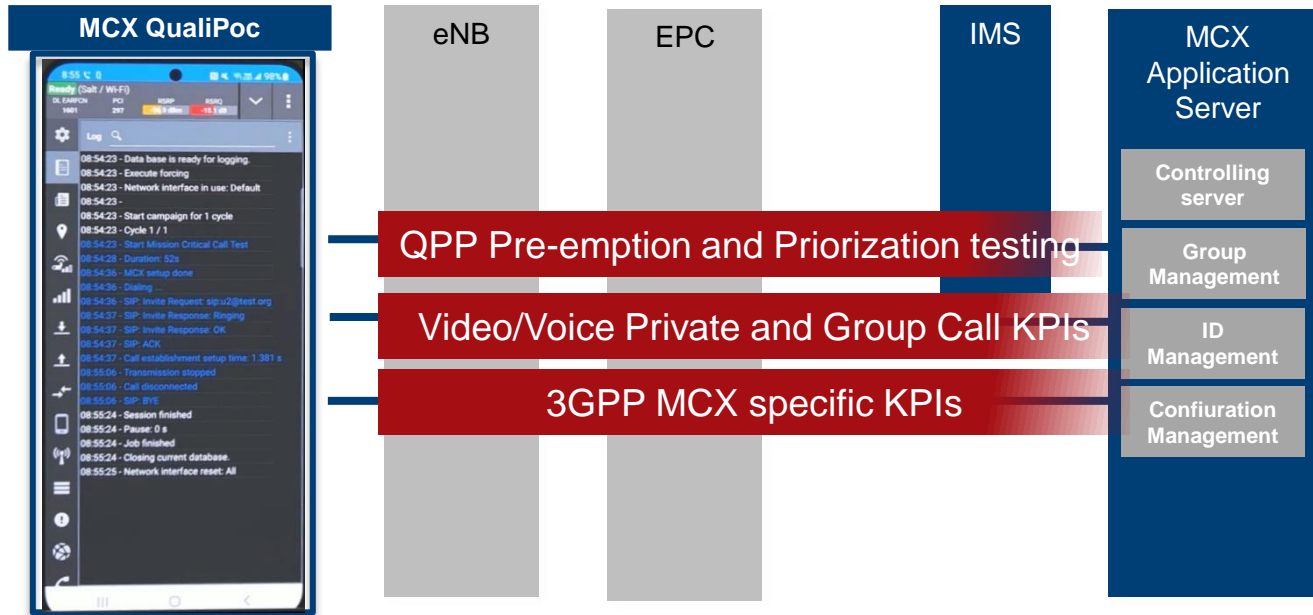
- Advanced channel and cell locking are crucial for RF optimization to control the quality and coverage of a wireless network

## ► OTA application update

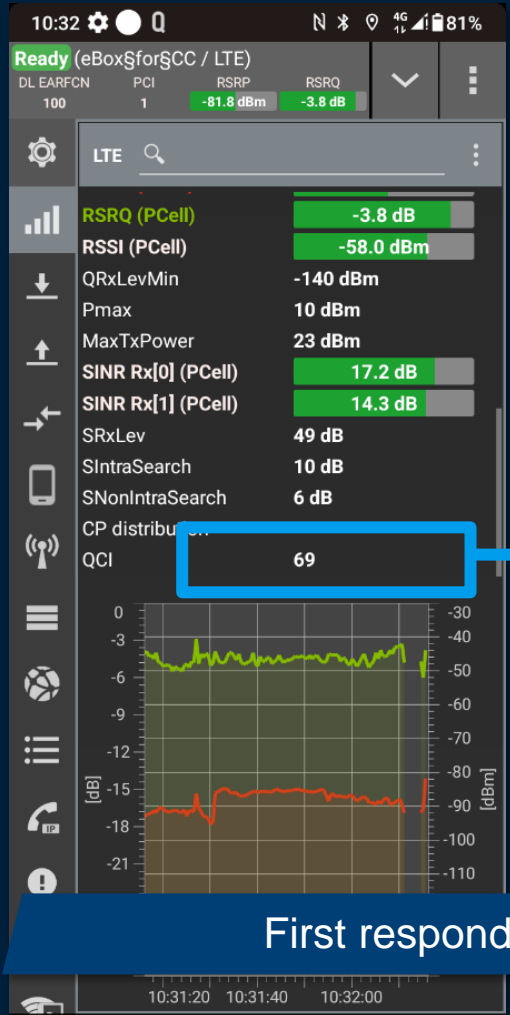
- The over-the-air update function offers a convenient way to keep QualiPoc application up to date



# MCX SPECIFIC NETWORK TESTING IS KEY!



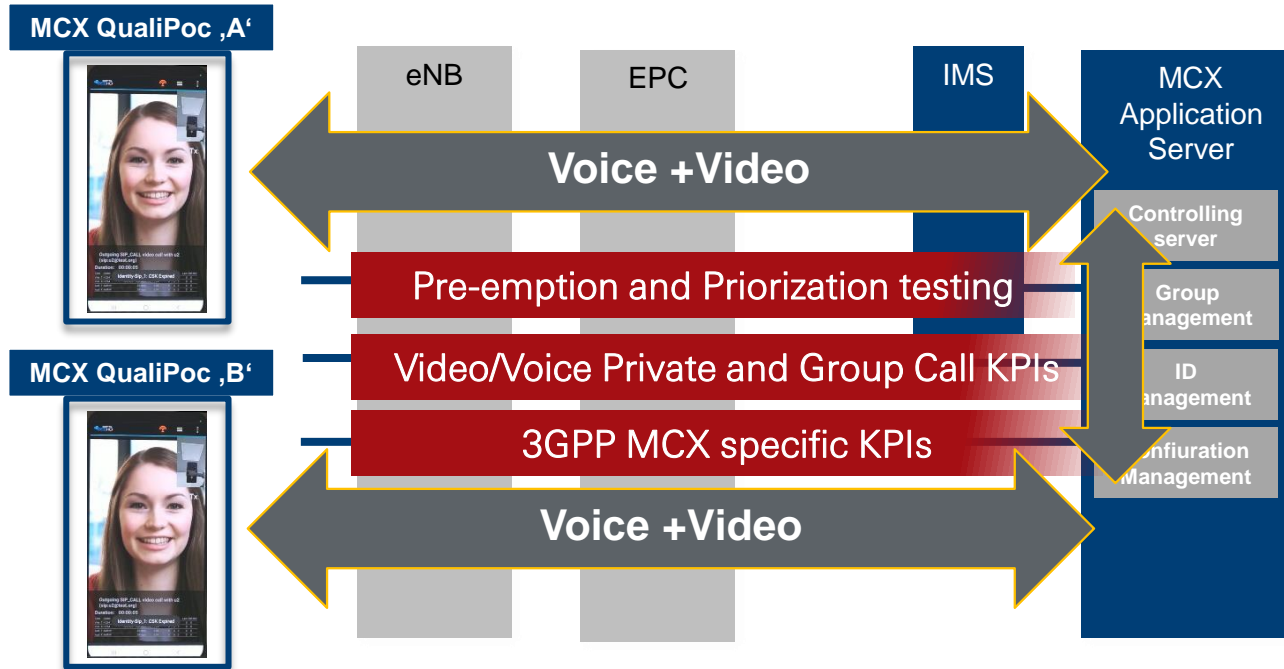
# MCX- PRIORITIZATION AND PREEMPTION TESTING



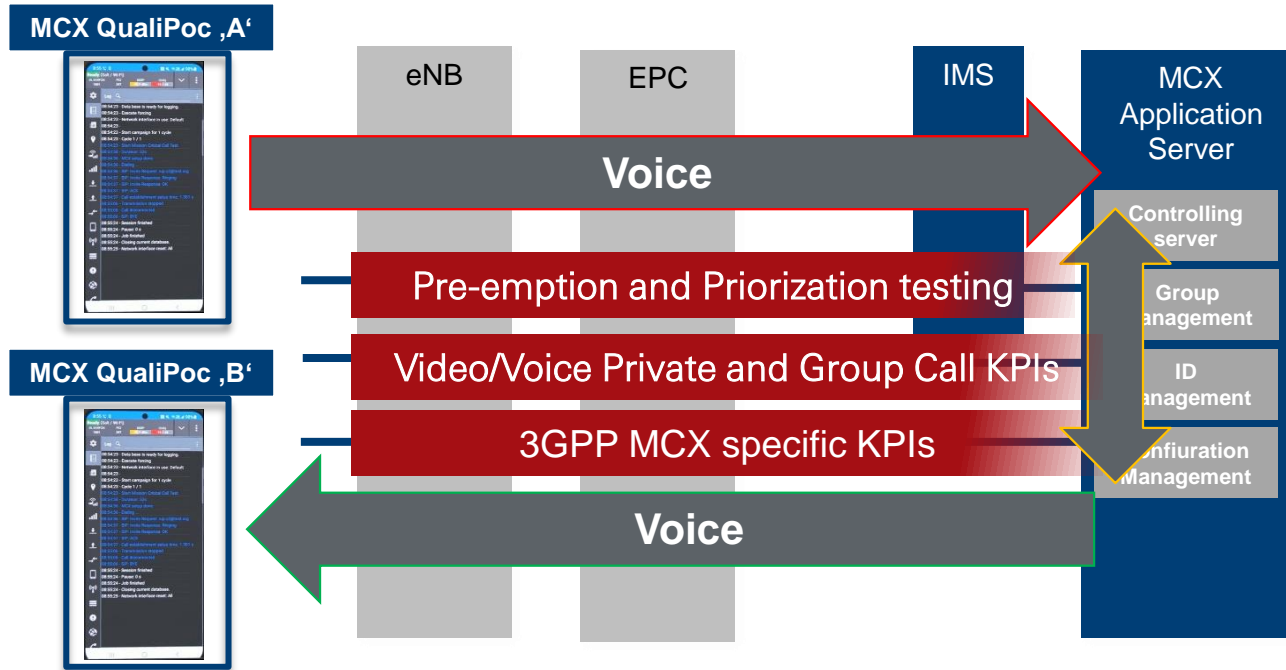
- QCI 65** Mission Critical user plane Push To Talk voice (e.g., MCPTT)
- QCI 67** Mission Critical Video user plane
- QCI 69** Mission Critical delay sensitive signalling (e.g., MC signalling, MC Video signalling)
- QCI 70** Mission Critical delay sensitive user plane

First responders must have priority in network! → MCX QCI/QI Testing

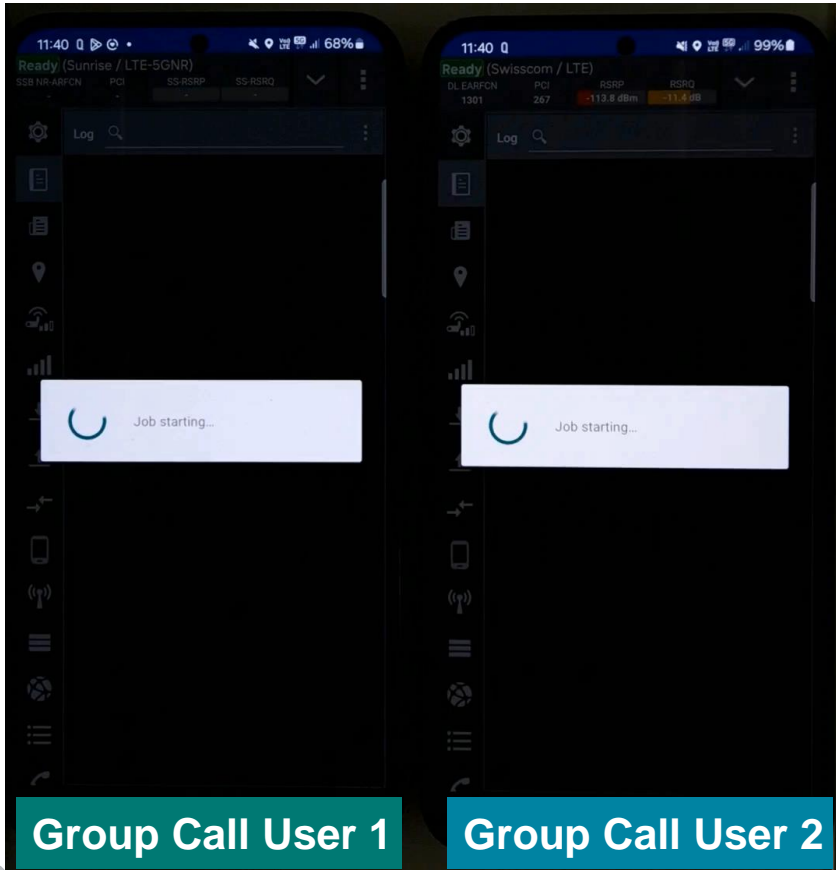
# MCX – TEST IMPLEMENTATION – PRIVATE VIDEO CALL



# MCX – TEST IMPLEMENTATION – GROUP CALL



# MCX – TEST IMPLEMENTATION – MCX GROUP CALL



## KPIs

```

11:40:55 - Start Mission Critical Call Test
11:41:00 - Duration: 52s
11:41:16 - MCX setup finished
11:41:18 - SIP: Invite from: sip:u3@test.org
11:41:18 - SIP: Invite : TRYING
11:41:18 - SIP: Invite Response: OK
11:41:18 - SIP: ACK
11:41:18 - MCPTT Access Time: 0.216 s
11:41:18 - End-to-End Access Time: 0.387 s
11:41:48 - SIP: BYE

11:40:54 - Start Mission Critical Call
11:40:59 - Duration: 52s
11:41:15 - MCX setup finished
11:41:16 - SIP: Invite from: sip:u4@test.org
11:41:17 - SIP: Invite : TRYING
11:41:17 - SIP: Invite Response: OK
11:41:17 - SIP: ACK
11:41:17 - Max Late Call Entry Time: 0.152 s
11:41:47 - SIP: BYE
    
```

**MCX KPI1**

**MCX KPI2**

**MCX KPI4**



Test. Measure. Innovate

THANK YOU  
VERY MUCH

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